



SWATCAM

Installation Manual

For assistance:



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1. Introduction

SWAT CAM is an automated imaging system which mounts to sprayer booms and captures images during field spraying operations. Once installed in the required location on the sprayer booms and connected to switched/key-on 12 volt power, the SWAT CAM system will autonomously capture 15 to 20 field images per acre. These images will be automatically uploaded to the SWAT RECORDS software platform where machine learning models quantify the crop and weed coverage independently. Crop and weed coverage maps are then created and the data is summarized by SWAT Zone.

The SWAT CAM system consists of the following major components:

- SWAT CAM Assembly (x2), Boom Mount Bracket (x2), and Boom Mount Bracket Fastener Kit – for system installation on the sprayer booms,
- Power Cable Assembly (x2) – for 12 volt DC power supply from the sprayer cab to each SWAT CAM assembly,
- Power Cable Y-Adapter (x1) – for connection of both power cable assemblies to a 3-pin AMP 12 volt DC power outlet in the sprayer cab,
- Power Outlet Adapter Cable (x1, if needed) – for adapting from the power cable Y-adapter to a 12 volt DC power outlet unique to the sprayer model.

Each SWAT CAM Assembly contains a mobile device and LED utility lamp as its primary operating components. The mobile device operation and function is configured specifically for the requirements of the SWAT CAM automated imaging system. The proprietary SWAT CAM application software controls the mobile device camera and transmission of captured images to the SWAT RECORDS software platform. The LED lamp provides supplemental lighting for enhancing captured image quality when performing spraying operations in low ambient light conditions.

Please read this manual in its entirety before attempting installation of the SWAT CAM system components. Every effort has been made to ensure the accuracy of the information contained in this manual. All supplied parts are selected to facilitate a complete installation. However, Croptimistic Technology Inc. cannot guarantee all parts will fit as intended due to sprayer boom variations that may exist due to manufacturer, model, model year, etc.



2. SWAT CAM Assembly Kit Contents



Fig. 1: SWAT CAM Assembly Kit Contents

ITEM	DESCRIPTION	QTY
①	SWAT CAM Assembly <ul style="list-style-type: none"> Includes all components contained within the assembly 	2
②	Boom Mount Bracket <ul style="list-style-type: none"> Must be mounted to the sprayer boom to allow installation of the SWAT CAM Assembly (item ①) 	2
③	SWAT CAM Assembly Mount Fasteners <ul style="list-style-type: none"> Carriage Head Bolt, 5/16" UNC x 1" Long – qty = 8 ea Flat Washer, USS, 5/16" – qty = 8 ea Nylon Insert Locknut, 5/16" UNC – qty = 8 ea 	
④	Boom Mount Bracket Fastener Kit <ul style="list-style-type: none"> Fasteners will be specific to sprayer model, and dependent on the configuration and dimensions of boom structure used for mounting 	1
⑤	Power Cable Assembly <ul style="list-style-type: none"> 85 ft long power cable to supply 12 volt DC power from the sprayer cab to the SWAT CAM Assembly 	2
⑥	Power Cable Y-Adapter <ul style="list-style-type: none"> Connects the 2 power cable assemblies (item ⑤) to a matching 12 volt power supply outlet in the sprayer cab 	1
⑦	Power Outlet Adapter Cable <ul style="list-style-type: none"> Connects the power cable Y-adapter (item ⑤) to a single 12 volt power supply outlet in the sprayer cab 	1
⑧	8" Cable Ties <ul style="list-style-type: none"> 100 cable ties/bag 	1
⑨	14" Cable Ties <ul style="list-style-type: none"> 25 cable ties/bag 	1

3. Pre-Installation Checklist

Prior to installation, the items in the following checklist should be reviewed to ensure a trouble-free installation of the SWAT CAM assembly components.

- a) Confirm the shipment includes all the SWAT CAM Assembly Kit contents and quantities as listed in the table on page 2. Note that the Boom Mount Bracket Fastener Kit (item ④) may be different than displayed in Fig. 1, and the Power Outlet Adapter Cable (item ⑦) may also be different than displayed or not included in the kit.
- b) Confirm that either the primary branch of the Power Cable Y-Adapter (item ⑥) or one end of the Power Outlet Adapter Cable (item ⑦), if supplied, connects to the 12 volt power outlet in the sprayer cab that will be used to supply power to the SWAT CAM system.
- c) Confirm that the 12 volt power outlet supplying power to the SWAT CAM system is configured for switched/key-on 12 volt power. The following method can be used as a simple and quick check.
 - With the ignition key in the OFF position, connect the main connector of the Power Cable Y-Adapter to the 12 volt power outlet. If a Power Outlet Adapter Cable was supplied, connect it to the 12 volt power outlet and to the main connector of the Power Cable Y-Adapter.
 - Pull the round connector end of the Power Cable Assembly (item ⑤) from ground level up into the cab and connect it to one of the split branches of the Power Cable Y-Adapter.
 - Connect the SWAT CAM Assembly (item ①) to the other end connector of the Power Cable Assembly.
 - Check that the LED light housed in the SWAT CAM Assembly is not powered on.
 - Start the sprayer engine and confirm that the LED light powers on. Shut the engine off and confirm that the LED light powers off.
- d) Park the sprayer in a flat, unobstructed area to allow unfolding of the booms.
- e) The following tools and equipment will be required for the installation of the SWAT CAM assembly components:
 - Ratchet and/or Cordless Impact Driver with Socket Adapter Bit
 - 1/2" Socket
 - 1/2" Combination Flat Wrench, qty = 2
 - 9/16" Socket (if 3/8" fasteners supplied Boom Mount Bracket Fastener Kit)
 - Side Cutters or Cable Tie Gun
 - Duct Tape
 - Stepladder



4. Mounting Guidelines

The following mounting guidelines will ensure optimal performance of the SWAT CAM imaging system for field image capture, analysis and reporting.

- a) The mounting locations for the SWAT CAM assembly are dependent on the overall boom width of the sprayer. To create an approximate evenly spaced grid of image locations over a mapped field, the recommended mounting location from the center line of the sprayer is a distance equal to $\frac{1}{4}$ of the overall boom width (Fig. 2).

For example, the mounting location distance from the sprayer center line for various boom widths is as follows:

- Boom Width = 90 ft → Distance to Mounting Location from Center Line = 27.5 ft
- Boom Width = 120 ft → Distance to Mounting Location from Center Line = 30 ft
- Boom Width = 135 ft → Distance to Mounting Location from Center Line = 34 ft

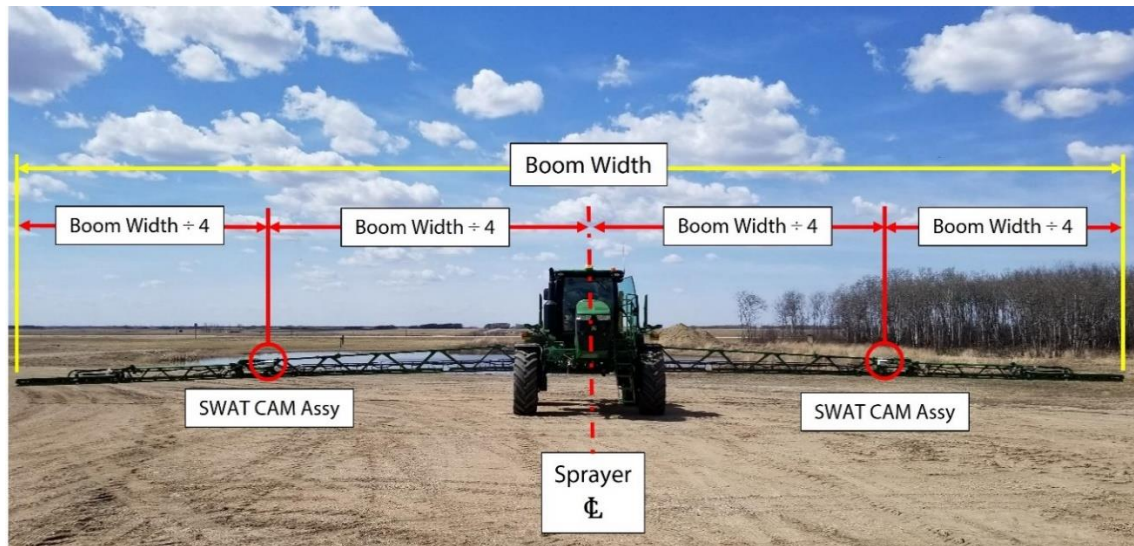


Fig. 2: SWAT CAM Assembly Mounting Location

This distance will most likely need to be altered by a few feet in either direction to allow mounting in a suitable location on the boom that will avoid interference with other components on the boom, and allow folding of the booms without the SWAT CAM assembly making contact with any parts of the boom structure. The mounting location can be at the top (Fig. 3), at the bottom (Fig. 4), or in the center of the boom (Fig. 5).

As a supplement to this manual, photo summaries of typical SWAT CAM Assembly installations on various sprayer models have been created for guidance on mounting locations. Select the link below to access a listing of the photo summaries.

<https://support.swatmaps.com/swat-cam>



Fig. 3: Mount Location at Top of Boom



Fig. 4: Mount Location at Bottom of Boom



Fig. 5: Mount Location in Center of Boom

- b) With the booms unfolded, place a piece of tape at the desired mounting location on the boom described in step 4. a). Proceed to fold the booms into transport position to determine if the mounting location will be acceptable.
- c) The boom configuration and fold sequence on some sprayer models may require positioning the SWAT CAM Assembly by hand at the marked mounting location to confirm acceptable clearances between the SWAT CAM Assembly and the structural features of the boom when the booms are in the folded position.

5. SWAT CAM Assembly Installation

The Boom Mount Bracket (item ②) must first be mounted to the sprayer boom. Once the bracket is mounted in the required location and orientation, install the SWAT CAM Assembly onto the bracket.

- a) After confirming the mounting locations on the booms, install the Boom Mount Bracket on the boom's structural beam using the supplied Boom Mount Bracket Fastener Kit (item ④). Depending on the structural configuration of the boom, the fastener kit options include:
 - U-bolts with flat washers and locknuts for direct mounting of the boom mount bracket to square or rectangular beam sections of the boom structure.
 - Muffler clamps with flat washers and lock nuts for direct mounting of the boom mount bracket to round beam sections of the boom structure.
 - A mount bracket backing plate and four (4) individual hex head bolts with flat washers and lock nuts. Length of the hex head bolts used for mounting will depend on the configuration/dimensions of the beam section being mounted to.

NOTE: The Boom Mount Bracket can be mounted in any orientation to allow for the optimum positioning of the SWAT CAM Assembly and ensuring high quality images are captured. Typical orientations are shown in Fig. 3, Fig. 4 and Fig. 5.

- b) Utilizing the adjustment provided by the slots in the boom mount bracket, install the bracket as vertical as possible on the sprayer boom. On certain sprayer models, this may not be possible due to the orientation of the structural beam on the boom that must be used for mounting. In these situations, rotational adjustment of the SWAT CAM assembly will be required for correct orientation of the assembly. This adjustment is described in section 8.
- c) Tighten all the fasteners evenly to secure the Boom Mount Bracket.

NOTE: If using the mount bracket backing plate and four individual fasteners, do not overtighten the fasteners as bending of the backing plate can occur.

- d) To assist with installation of the SWAT CAM Assembly, remove the top lid by loosening the front two fasteners securing the lid in place. The fasteners do not need to be removed.
- e) Mount the SWAT CAM Assembly by positioning the bracket tabs at the rear of the assembly on the inside of the Boom Mount Bracket. The series of square holes in the bracket tabs combined with the slots in the Boom Mount Bracket provide a range of vertical positioning and adjustment of the SWAT CAM Assembly. Utilize the adjustment as needed for required clearances and/or avoiding interference with any other components on the sprayer boom.
- f) Use the four carriage head bolts, flat washers and lock nuts to secure the SWAT CAM Assembly to the Boom Mount Bracket. Note the installation tip shown in Fig. 6.
- g) Repeat steps 5. a) to 5. f) for SWAT CAM Assembly installation on the other boom.



NOTE: Install one of the upper carriage head bolts first (Fig. 6), and add the flat washer and lock nut to keep the bolt in place. Slide the SWAT CAM Assembly vertically and/or rotate the assembly to ease installation of the upper carriage head bolt and the two lower carriage head bolts.



Fig. 6: Initial Upper Carriage Head Bolt Installed

6. Power Cable Assembly Routing

Power Cable Assemblies (item ⑤) supply 12 volt power from the interior of the sprayer cab to each SWAT CAM Assembly mounted on the boom.

- a) Begin routing the power cable from the SWAT CAM Assembly location on the boom. Follow existing cables and hoses for routing the power cable along the sprayer booms. On some sprayer models, there may be clamps or hold-downs available for securing the power cable (Fig. 7).



Fig. 7: Power Cable Routing Along Boom

- b) At the boom folding/pivot and lifting locations, follow the routing of existing cables or hoses and ensure adequate slack in the power cable to accommodate movement, stretching, etc. of the cable when the booms are folded/unfolded and lowered/raised.
- c) Bring the cables from both SWAT CAM Assemblies to a common point on the center boom section. On rear boom sprayer models, route both power cables together up and over the center boom section and lift arm frame (Fig. 8).
- d) Route both cables along the main supply hose (Fig. 9) for transitioning from the booms to the sprayer chassis. Use a stepladder to safely access the area at the rear of the sprayer chassis.

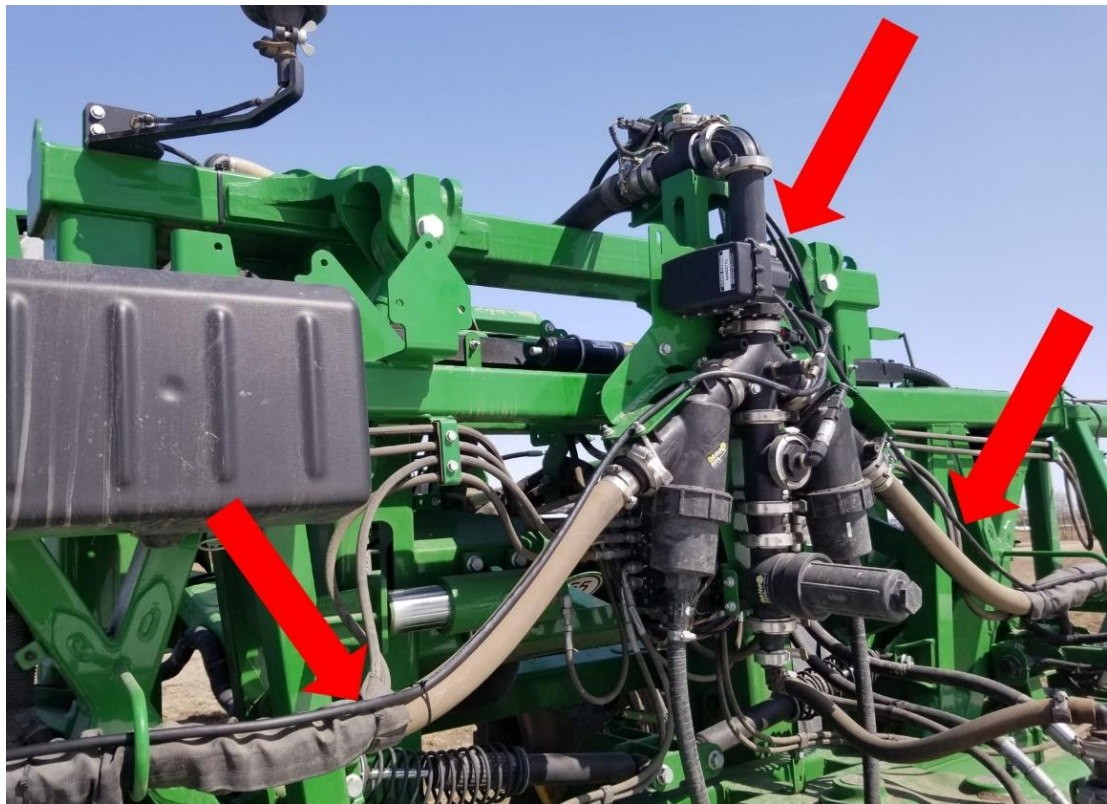


Fig. 8: Power Cable Routing at Rear of Sprayer



Fig. 9: Power Cable Routing Along Main Supply Hose

- e) Continue routing the power cables to the rear underside of the sprayer cab by following electrical cables and system hoses on either the left or right side of the sprayer chassis.
- f) Once the power cables reach the rear underside of the cab, identify the location where existing electrical cables enter the cab (Fig. 10), or if the cab has a dedicated entry point with a grommet (Fig. 11) that allows power cable routing for accessory equipment. It may be necessary to cut a slit in the grommet to allow pass through of the cables.



Fig. 10: Cable Entry On Underside of Cab Floor (Case IH Patriot)



Fig. 11: Entry Grommet at Right Rear Corner of Cab (John Deere)

- g) Feed the ends of both power cables into the cab through the entry grommet (Fig. 12) or other suitable entry point (Fig. 13).

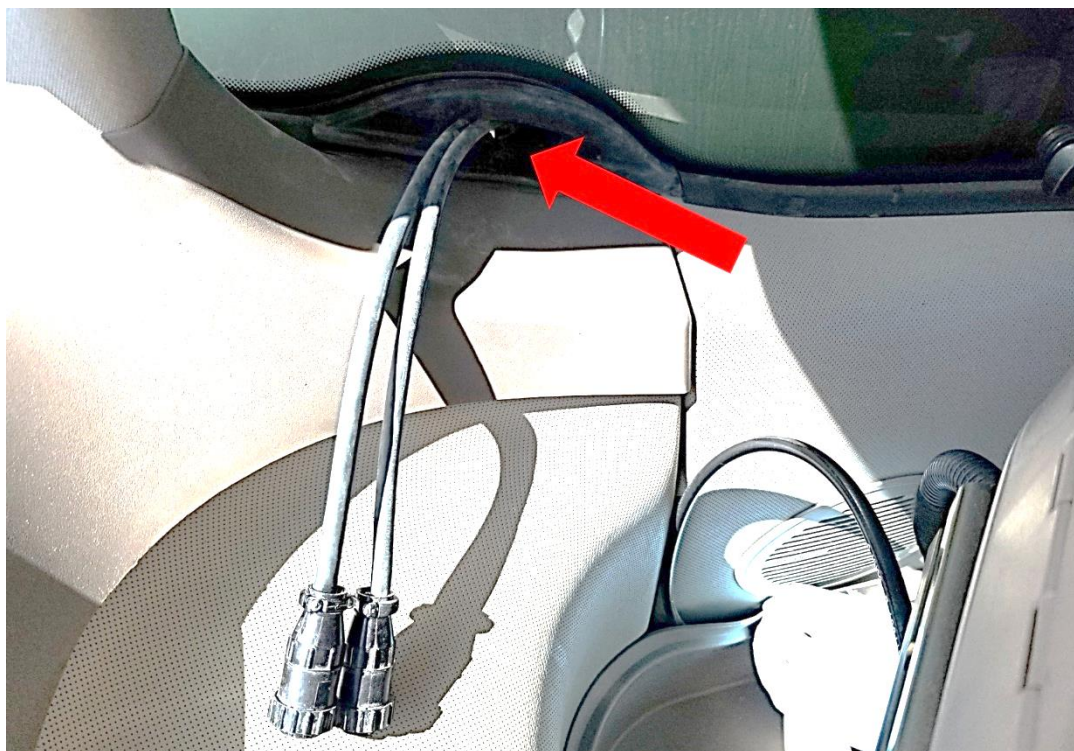


Fig. 12: Power Cables Routed Into Cab (John Deere)



Fig. 13: Power Cables Routed Into Cab (Case IH Patriot)

NOTE: Excess power cable length will likely exist. Once power supply to the SWAT CAM Assembly is confirmed, and no power cable pinching or stretching is observed during folding/unfolding of the booms, the excess power cable length can be bundled and secured in an area under the sprayer cab. See step 9. d) on page 19.

7. Power Supply Connections

The SWAT CAM system requires switched/key-on 12 volt power for operation. The Power Cable Y-Adapter (item ⑥) allows connection of the two Power Cable Assemblies (item ⑤) to a 12 volt power outlet in the sprayer cab.

- a) Connect each of the power cables to the branch harnesses of the Y-power cable adapter (Fig. 14).



Fig. 14: Power Cable Assemblies Connected to Power Cable Y-Adapter

- b) The options and outlet configuration for 12 volt power supply will differ depending on sprayer manufacturer, and sprayer model or model year in some instances. Most sprayers will have a 3 terminal round connector, or an additional power receptacle configuration such as the John Deere power strip (Fig. 15).

NOTE: Only connect the SWAT CAM system to switched/key-on 12 volt power supply outlets. DO NOT use direct-to-battery/constant 12 volt power supply connections.



Fig. 15: 12 Volt Power Outlet Options (John Deere)

- c) With the ignition key in the OFF position, connect the Power Cable Assemblies to the receptacle on the exterior of the SWAT CAM Assemblies, and connect the Power Cable Y-Adapter to the 12 volt outlet selected and tested in step 3. c) of the Pre-Installation Checklist.
- d) Turn the ignition key to the RUN position for accessory power, or start the sprayer engine. Confirm that the mobile device and LED light in each of the shroud SWAT CAM Assemblies are powered on and operating.

NOTE: It will take approximately 30 seconds for the SWAT CAM info screen to appear on the mobile device display.

8. SWAT CAM Mobile Device Adjustment

After mounting and securing the SWAT CAM Assemblies in position, the mobile device may require adjustment to ensure its side-to-side and front-to-back operating angles are correct for optimal field image capture.

- a) Unfold and level the booms. Set the booms at a height above ground level that is representative of spraying operations.
- b) Check the mobile device screen display for the "Roll" and "Pitch" values (Fig 16). The target values are as follows:
 - Roll = 6.0° to 8.0°
 - Pitch = as close to 0.0° as possible (between 0.2° to -0.2° is acceptable)

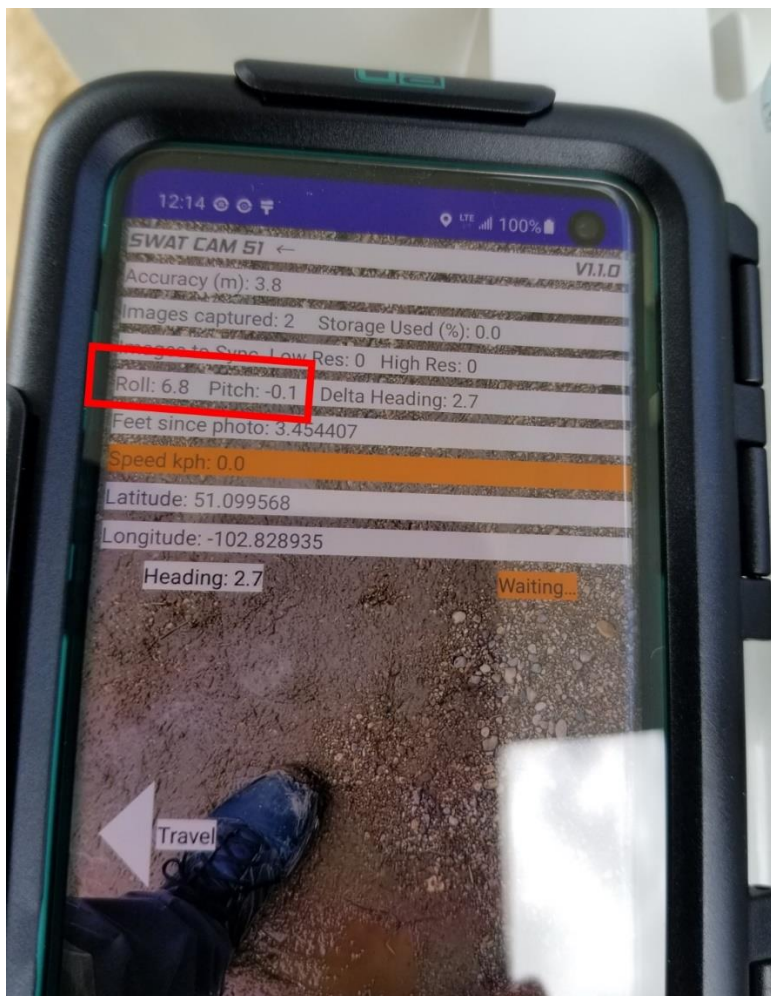


Fig. 16: Roll & Pitch Values - SWAT CAM Info Screen

c) If the values do not fall inside the range listed above, adjust the angle of the SWAT CAM Assembly housing and/or the mobile device/light mount bracket as follows:

- Pitch Adjustment:

- Using two 1/2" flat wrenches, loosen the two fasteners at the rear of the housing assembly (Fig. 17) to allow the housing to be slid vertically upward slightly and rotated about the lower fastener.
- Rotate the housing until the Pitch value displayed reads as close to 0.0° as possible (between 0.2° to -0.2° is acceptable).

NOTE: Changing the angle in small increments is a fine adjustment that may require only a slight rotation of the SWAT CAM Assembly housing, and may also be affected by tightening the fasteners.

- Hold the housing in position and tighten the two fasteners at the rear of the housing.



Fig. 17: Fasteners for Pitch Adjustment

- Roll Adjustment:

- Loosen the four fasteners (Fig. 18) securing the mobile device/light mount bracket to the sides of the housing just enough to allow forced rotation of the bracket about the upper fastener.
- Rotate the bracket until the Roll value displayed on the screen reads between 6.0° and 8.0°.

NOTE: Changing the angle in small increments is a fine adjustment that may require only a slight rotation of the shroud, and may also be affected by tightening the fasteners.

- Hold the bracket in position and tighten the four fasteners on the sides of the housing.

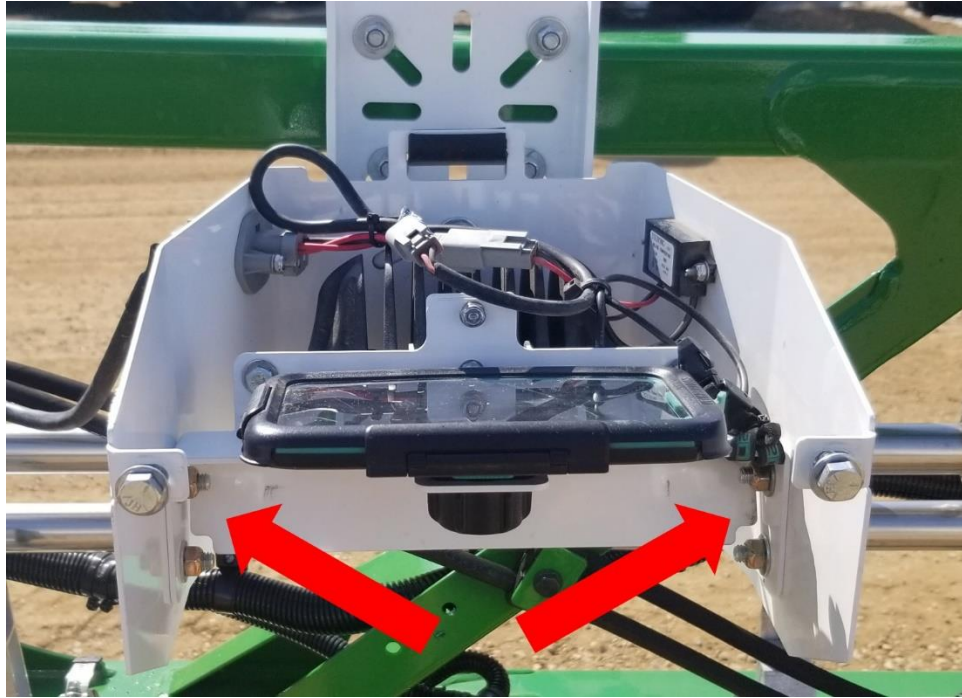


Fig. 18: Fasteners for Roll Adjustment

- d) Re-install the top lid on the housing. Tighten the front two fasteners to secure the lid in place.
- e) Repeat steps 8. a) to 8. d) for the other SWAT CAM Assembly.

NOTE: The device screen does not display the actual image area captured by the device camera. The actual image area will be larger than what is displayed on the device screen. Therefore, the boom or other components not visible on the device screen may appear in the captured image.

9. Final Installation Items & Checks

Perform the final installation steps and checks to complete the installation procedure:

- a) Reinstall and securely fasten the top lids to both SWAT CAM Assemblies.
- b) Fold the booms into transport position in a controlled sequence to allow checking for pinching or stretching of the power cables at critical locations, and to confirm no interferences between the SWAT CAM Assemblies and boom structure during folding of the booms into transport position.
- c) Unfold and lower the booms to accommodate installing cable ties along the length of the booms to secure the power cables in position. Also secure the pair of power cables along their route from the center boom and along the sprayer chassis to the rear of the cab.
- d) Bundle the excess length of the power cables under the cab (Fig. 19), or another suitable location, and secure the bundle to the sprayer frame using cable ties.



Fig. 19: Power Cable Bundled & Secured to Frame Under Sprayer Cab

- e) Trim the ends of all cable ties.
- f) Clean the mobile device case camera window using a soft cloth.
- g) Fold the booms into transport position and perform a final check for pinching or stretching of the secured power cables at critical locations.
- h) If necessary, seal the Power Cable Assembly entry point into the cab with silicone or foam material cut-to-fit.

10. Image Upload & Quality Check

The correct operation of the SWAT CAM imaging system must be confirmed after installation and prior to spraying operations. Perform the following steps to confirm captured images are uploaded to the SWAT RECORDS software platform and the quality of images satisfies the requirements for machine learning analysis.

- a) With the sprayer booms unfolded and lowered to a typical spraying height, drive a 1 to 2 acre pass in a SWAT mapped field.
- b) After completing the field drive, scan the **Submit a Support Ticket** QR code below with your mobile device camera. Tap the pop-up notification to be directed to the on-line Support Ticket form.

Submit a Support Ticket:



- c) Enter your first name, last name, email address and phone number (optional) in the form entry fields.
- d) Scroll to the bottom of the form page and select "*Submit*".
- e) Upon receipt of the Support Ticket, Croptimistic Technology Inc. will review the images captured by your SWAT CAM system to verify the images are uploaded to SWAT RECORDS and image quality satisfies the requirements for accurate analysis.
- f) Croptimistic Technology Inc. staff or your service provider partner will reply by email confirming your SWAT CAM system is installed correctly, or requires adjustments to improve image quality. If adjustments are required, recommendations will be provided.

